UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN
ENGINEERING

NOTICE: **Return or renew all Library Materials! The *Minimum* Fee for each Lost Book is $50.00.**

JUN 27 1988

The person charging this material is responsible for its return to the library from which it was withdrawn on or before the **Latest Date** stamped below.

Theft, mutilation, and underlining of books are reasons for disciplinary action and may result in dismissal from the University.
To renew call Telephone Center, 333-8400

UNIVERSITY OF ILLINOIS LIBRARY AT URBANA-CHAMPAIGN

L161—O-1096

Digitized by the Internet Archive
in 2012 with funding from
University of Illinois Urbana-Champaign

http://archive.org/details/twopapersoneffec73folk

310.84
I63c
no.73

Engin.

CONFERENCE ROOM

ENGINEERING LIBRARY
UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

Center for Advanced Computation

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
URBANA, ILLINOIS 61801

CAC Document No. 73

TWO PAPERS ON THE EFFECTS OF MANDATORY DEPOSITS ON BEVERAGE CONTAINERS

By

Hugh Folk

November 1972
January 1973

CAC Document No. 73

TWO PAPERS ON THE EFFECTS OF MANDATORY DEPOSITS ON BEVERAGE CONTAINERS.

By

Hugh Folk

Center for Advanced Computation
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

November 1972
January 1973

This work was supported in part by the Illinois Institute for Environmental Quality and in part by the Minnesota Pollution Control Agency.

TABLE OF CONTENTS

PAPER NO. 1: Employment Effects of the Mandatory Deposit Regulation

ABSTRACT

I. Expenditure Flows and Employment 2

II. Application of Expenditure Analysis to this Problem 2

III. Containers for Beverages in the United States and Illinois 3

IV. Economic Consequences of the Deposit Regulation 8

V. Employment Effects of the Deposit Regulation 16

VI. Summary and Conclusions 24

REFERENCES 26

PAPER NO. 2: Employment Effects of a Ban on Nonreturnable Beverage Containers in Minnesota

ABSTRACT

I. Expenditure Flows and Employment 28

II. Effect of a Ban on Beverage Sales 30

III. Effect of a Ban on Prices 33

IV. Consumer Savings 39

V. Employment Effects 47

VI. Summary and Conclusions 56

REFERENCES 58

APPENDIX A 59

APPENDIX B 62

LIST OF TABLES

1. Estimated Sales of Beer and Soft Drinks, by Container Type, United States, 1958-1970 (Billions of Containers) 4

2. Price per Container and Price per Ounce, Beer and Soft Drinks, Illinois, Summer 1971 6

3. Estimated Sales of Beer and Soft Drinks, by Container Type, Illinois, 1962-1970 (Billions of Containers) 9

4. Estimated Sales of Beverages at Super Market Prices, Illinois, 1970 13

5. Beverage Sales and Container Costs for a Complete Shift to Returnables 14

6. Value of Shipments and Value Added by Manufacture in Selected Industries Related to Beer and Soft Drink Manufacture and Sale, United States and Illinois, 1968-1969 (Millions of Dollars) . . 18

7. Estimated Employment in Selected Industries Related to Beer and Soft Drink Manufacture and Sale, United States and Illinois, 1968-1970 (Thousands of Workers) 19

8. Total Requirements Coefficients, Shipments, Employment, Ratio of Employment to Shipments, Employment per Million Dollars of Metal Cans Delivered to Final Demand and Estimated Reduction in Employment Resulting from a Complete Shift to Returnables Illinois, Selected Industries 21

9. Total Requirements Coefficients, Shipments, Employment, Ratio of Employment to Shipments, Employment per Million Dollars of Glass Containers Delivered to Final Demand and Estimated Reduction in Employment Resulting from a Complete Shift to Returnables, Illinois, Selected Industries 22

10. Soft Drink Volume, Price per Ounce, and Sales for Home Market and Total Case Sales, Estimated Consumer Savings from a Ban on One-Way Containers, Minnesota, 1972 estimated, and Postban . . 42

11. Estimated Sales of Beer by Volume in Minnesota, 1972 44

12. Estimated Beer Sales, 1972 and Post Ban, by Container Type . . 46

13. Cases Distributed Per Man-Year of Employment Soft Drink Bottlers, Brewers and Beer Distributers 50

14. Estimated Direct and Indirect Employment Effects of Reduction in Can and Bottle Purchases as a Result of the Ban, Minnesota . 54

Paper No. 1

EMPLOYMENT EFFECTS OF THE MANDATORY DEPOSIT REGULATION

ABSTRACT

The regulation requiring a five cent deposit on all beverage containers proposed by the Solid Waste Management Task Force of the Illinois Institute for Environmental Quality for adoption by the Illinois Pollution Control Board can be expected to have significant employment effects. This report attempts to identify and measure these employment effects using straight-forward economic impact analysis, which in this instance is complicated by the desirability of identifying and measuring those effects that occur within the State of Illinois.

The first section of the paper briefly describes the general pattern of expenditure flows and the effects of changes in flows on employment. The second section specifies particular features of this conceptual model to the problem investigated and points out the data problems which impede the analysis. The third section describes the trend to non-returnable containers and discusses some of the industrial impacts and problems involved in this shift. The fourth section examines the economic consequences of the deposit regulation. The fifth section estimates the employment effects of the regulation. The sixth section is a summary of findings and examines some of the implications of alternative ways of imposing the regulation.

I. Expenditure Flows and Employment

The analysis is based on the changes in employment that result from changes in the flow of expenditure. The underlying principles are quite simple.

(1) a rise in price of a commodity leads to a decrease in consumer purchases of that commodity;

(2) a decrease in sales of the product leads to a reduction in retailer orders from suppliers;

(3) a reduction of orders for a supplier leads to a reduction in his orders from manufacturers;

(4) a reduction in orders for a manufacturer leads to curtailment of production and a reduction in purchases of materials and supplies and a reduction in manufacturer's employment;

(5) the reduction in purchases of materials and supplies has the same employment effects as sequence on suppliers of materials to the manufacturer;

(6) the reduction in employment leads to a reduction in earnings, and, therefore, in all consumer spending.

A reduction in consumer spending on one product is generally offset by an increase in spending on other products since consumer spending is generally a large and fairly stable percentage of consumer income.

Thus the diversion of consumer spending from one product to others generates a sequence of direct effects and indirect effects which spread through the economy and eventually affect industries which make no obvious direct contribution to the production of the industry initially affected. Both direct and indirect effects of a reduction in commodity spending are generally completely offset by the corresponding increases resulting from the increased spending on other products.

Things can go wrong. A decrease in spending on domestic products offset by increased spending on imported products can lead to spending and employment "leakages" which result in lower total spending, wages, and employment. The levels of employment before and after a change in spending can be changed too, even though the aggregate amount of wages remains unchanged. A recent study of the impact of disarmament in the United States found that a full-employment shift from heavy concentration on defense to more civilian emphasis would lead to an increase in employment levels [8].

II. Application of Expenditure Analysis to this Problem

Retailers will be required to collect a $.05 deposit for each container sold for off-premise consumption. The regulation may change the mix of

packages in which beverages are sold, but how great the shift will be is impossible to determine with any high degree of confidence. The effect of the regulation on total sales is not known. The numbers of beverages and containers presently sold and their distribution among taverns, restaurants, vending machines, and other retail outlets is not known either. Where the containers in which the beverages sold in Illinois are manufactured is not known, nor is it known where Illinois manufactured containers are sold.

Available is some limited information on employment, shipments, value added by manufacture, and related industry statistics from the 1967 Census of Manufacturers, recent industry employment figures from County Business Patterns, some information on beer consumption, based on tax records, and some estimates of national soft drink and beer sales and packaging by container type.

Thus the knowledge needed for a complete and persuasive impact analysis is lacking, as it nearly always is in any particular application. To make any progress toward a rational judgment on the employment impacts, a number of assumptions.must be made, any one of which may be questioned. As pointed out in the preceding section, however, there is reason to be confident that a diversion of spending from one form of container to another will result in changes in spending on other commodities which will tend to offset any favorable total spending and wage effects.

III. Containers for Beverages in the United States and Illinois

Containers for beverages make up about one-half of all food and beverage containers sold in the United States. In 1970, an estimated 47.4 billion fillings of soft drinks and 35.6 billion containers of beer and related malt liquors were sold in the United States [Table 1]. The number and the proportion of beverage containers in the total would have been much larger except for the important role that returnable containers still play. In terms of fillings, beverages were packaged as follows in 1970:

	Percentage of Fillings	
	Soft drinks	Beer
Bottles, total	72.4	47.2
non-returnable	(17.5)	(20.2)
returnable	(54.9)	(27.0)
Cans	27.6	52.8
Total	100.0	100.0

The trend to non-returnables. Sales of nonreturnable bottles and cans have increased rapidly in the past decade, while use of returnable bottles has declined. There are several reasons for the persistence of returnables. First, the unit prices of soft drinks are in the $.10 to $.15 range, and the cost of a non-returnable container is close to $.05 and therefore a very

TABLE 1

Estimated Sales of Beer and Soft Drinks, by Container Type, United States, 1958-1970

(billions of containers)

	Soft drinks[a]					Beer[a]				
		Bottles[a]					Bottles[a]			
Year	Total	Total	Non-re-turnable	Return-able	Cans[b]	Total	Total	Non-re-turnable	Return-able	Cans[b]
1970	47.4	34.3	8.3	26.0	13.1	35.6	16.8	7.2	9.6	18.8
1969	47.9	36.1	6.4	29.8	11.8	34.9	18.2	6.9	11.3	16.7
1968	41.1	31.0	4.6	26.4	10.0	32.2	16.9	6.0	10.9	15.3
1967	39.9	32.7	3.6	29.1	7.2	30.8	17.0	5.8	11.2	13.8
1966	37.6	32.0	2.0	30.0	5.6	27.6	14.7	5.0	9.7	12.9
1965	37.0	33.2	1.0	32.1	3.8	26.2	14.8	4.7	10.1	11.4
1964	34.4	31.6	.6	31.0	2.8	25.8	14.9	4.4	10.5	10.9
1963	32.3	30.2	.6	29.6	2.1	24.6	15.3	3.9	11.4	9.3
1962	31.2	29.6	.5	29.1	1.7	24.0	15.0	3.4	11.4	9.1
1961	30.8	29.5	.4	29.1	1.2	23.2	14.4	2.8	11.6	8.8
1960	29.3	28.5	.2	28.2	.8	22.5	13.6	1.9	11.7	8.9
1959	32.2	31.7	.2	31.5	.5	23.1	14.8	1.4	13.4	9.2
1958	30.3	29.8	.2	29.7	.4	22.7	14.3	1.2	13.1	8.3

a. based on the number of crowns

b. Estimated at 500 cans per base box of metal after 1966.

Source: 1958 to 1965, Midwest Research Institute, The Role of Packaging in Solid Waste Management, Bureau of Solid Waste Management, Environmental Protection Agency, Washington, D. C. Table 26, p. 44., 1969.

1966 to 1970, estimated from U. S. Department of Commerce, Bureau of the Census, Current Industrial Reports, Series M-32G and M-34D, Washington, D. C., 1966-1970, and from Bureau of Census data compiled in Glass Container Manufacturers Institute, Glass Containers, 1971, New York, 1971.

considerable part of the total revenue from the product. The consumer who is willing to gather up, store, and return his containers is usually better off in buying the returnable container. If, however, he does not wish to return containers he is usually better off in buying the non-returnable on which he presently does not have to pay a deposit. Second, the soft-drink market is largely local. Because soft-drink franchises are geographically restricted it is relatively easy for the bottler to manage a returnable system. Since returnables cost about twice as much as non-returnables, any trippage over five or six is likely to provide the bottler with an economic saving which will permit him to sell returnables cheaper than non-returnables. Third, returnables are the traditional way of doing business in the soft drink industry and bottlers have plants and trucks adapted to the system. Fourth, the soft-drink industry is competitive. As long as one bottler persists in supplying returnables at low cost, the other major brand bottlers dare not abandon this cheaper alternative. Consumers have strong preferences for brands, certainly, but these are not so strong as to allow a bottler to preserve his market share at a premium price. Consumers have container preferences as well, and most bottlers provide a variety of packages.

The returnable system for beer bottles has declined for several reasons. First, beer prices are considerably higher than soft drink prices, so that container cost is relatively less important. Moreover, the differential between returnable and non-returnable beer packages of the same size is smaller than the differential for soft drinks [Table 2]. This difference results from the national markets of many of the major brewers for whom the returnable system must be much more expensive than for the locally based soft-drink bottler. Price competition in the beer industry is apparently less effective than in the soft-drink industry (brand preferences are stronger), so that "premium beers" sell for considerably more than "regular beers."

The rapid growth in the use of non-returnable containers both for beer and soft drinks is the result of consumer preference, or at least tolerance, for non-returnables. The average consumer uses about 400 units of beverages a year. At a unit cost of $.04, this represents an additional annual expenditure of about $16 for the consumer who uses non-returnables exclusively over what he would pay had he used returnables exclusively. Of course, most consumers use some returnables (in vending machines or taverns), and most use some non-returnables (in restaurants or airlines.) For the consumer buying for home use where the choice of containers is discretionary, the use of non-returnables might add $8 or $10 in additional cost, a significant amount for many consumers.

The non-returnable container may be particularly convenient in certain instances. The consumer who shops while walking from work or transportation, or who buys for traveling or picnics, or who lives where there are no facilities for cooling or keeping drinks may value the convenience highly. Central city residents apparently have been prime users of non-returnables, for trippage tends to be low in both Chicago and New York, and non-returnables sell very heavily. Suburban residents, however, often suffer little additional inconvenience from returnables, since driving to shop is common. Trippage is correspondingly somewhat higher in the suburbs. This pattern of trippage and use of non-returnables suggests that it is not the price of the container system reflected in beverage costs that is the critical determinant of the choice of containers. Over time, of course, affluence has increased, and this has

TABLE 2

Price per Container and Price per Ounce, Beer and Soft Drinks, Illinois, Summer 1971

	Returnable bottles				Non-returnable bottles					Cans	
Size in ounces	32	16	12	7	32	28	16	12	10	16	12
Retail price per package											
Premium beer	47.6		21.4		54.9			22.2		27.8	22.9
Regular beer	40.8		18.7		46.1			19.6		24.9	20.3
Average	44.2		20.0		50.5			20.9		26.4	21.6
Soft drinks	29.6	12.8	13.2	15.5	34.7	33.7	16.5		14.6		15.9
Price per ounce											
Premium beer	1.48		1.77		1.71			1.85		1.74	1.90
Regular beer	1.27		1.55		1.44			1.63		1.55	1.69
Soft drinks	.925	.800	1.10	1.65	1.09	1.20	1.09		1.45		1.32

Source: Derived from Beverage Containers, Recommendations of the Illinois Solid Waste Management Task Force, Illinois Institute for Environmental Quality, IIEQ Document No. TF-1, Springfield and Chicago, 1971.

permitted consumers to pay less attention to the costs of containers, but at any one time it appears that those who are least able to pay are the least likely to save the few cents that can be gained from choosing returnables and returning the bottles.

The shift to non-returnables has also been impelled by availability. Because non-returnable soft drinks were not commonly available until the past few years, they made little impact. Today, however, a particular brand or size desired may not be available in returnable bottles in many stores. In communities such as New York in which the shift to non-returnables has been extensive, the question of consumers' preferences for non-returnables is moot, since they are not available as a reasonable alternative. Inadequate facilities for redeeming returnables also makes them effectively unavailable for many consumers. In many instances redeeming a few bottles becomes a major task. Rarely is it possible to carry out this transaction at the checkout counter (as one can do with the "$.05-off" coupons).

Some people argue that consumers are so ignorant of prices and so confused by the variety of brands, sizes, and container types facing them that they may be buying substantial numbers of non-returnable containers under the misapprehension that they represent an economical alternative. The fact that in Illinois deposits were until recently commonly included in the price of the package is thought to contribute to these misapprehensions. There is probably some truth in these arguments. If, however, non-returnables persist after the recent adoption of the legal requirement that price and deposit must be separatelely listed and after major chains post prices per ounce, then it will be clear that ignorance was not an important cause of the shift to non-returnables.

Whether consumers consciously chose non-returnables because they preferred them, or they were tricked into it, the result has been the same--an increasingly large fraction of the market has moved into non-returnables.

Critics of non-returnables argue that they are costly, a waste of scarce energy, and contribute unnecessarily to solid waste problems and litter.

There are strong proponents of non-returnables as well. Much of the growth in sales of the glass container industry and the metal can industry in the past decade has come from these containers. These are important industries in Illinois and the employment and welfare of many Illinois workers depends on the continued production of these products. Many national brewers and producers of house-brand soft drinks see in these containers the solution to their packaging problems. Retailers are in the middle. There are obvious advantages in non-returnables. Currently, mark-ups are usually somewhat higher for non-returnables than for returnables even though non-returnables are generally less trouble and expense for retailers. Returnables require more space and labor in redemption and stacking. Many retailers are unhappy with the problems of handling both returnables and non-returnables and would prefer one system or the other but not both at the same time. Those soft-drink bottlers who have already made the transition to non-returnables would like to see the transition completed, but many bottlers strongly prefer the returnable system and are reluctant to go exclusively into the non-returnable system. Like retailers, however, they face the problems and expense of multiple lines, inventories, and other inconveniences of handling both systems at the same time.

The principal beneficiaries of the shift to non-returnables have been the container manufacturers, canners of house-brand soft drinks, and concentrated national brewers and their employees. A return to the returnable system would involve these firms in substantial competitive disadvantage, layoffs, additional costs, and capital losses. For local soft-drink bottler there would be additional labor costs and capital losses, but such a shift would benefit them in their competition against house brands (which are exclusively packaged in cans) and would eventually save them the capital costs of multiple lines, although it might involve immediate capital losses from the canning lines rendered useless. Retailers would be affected as well, since the shift would probably change their profits from this important component of super-market and convenience store sales.

Beverage containers in Illinois. There is little information available on the use of different containers in Illinois. The distribution is probably similar to the national pattern. One Chicago bottler estimates that th proportion is about one-half returnables for soft drinks, with national bran having a somewhat larger proportion of returnables [4]. Information is also scanty on the quantity of beverages sold in Illinois as well. Estimates on the volume of beer consumed and Illinois' share of national consumption [9] make it possible to estimate Illinois beer sales by container type on the assumption that the distribution is the same as the national pattern. No dire information was available on the sales of soft drinks in Illinois; however, assuming that the proportion of all soft drinks sold in Illinois was the sam as the proportion of all shipments from the Illinois bottled and canned soft drink industry (SIC 2086) to the total in 1967, and assuming that the distribution of containers in the United States it is possible to estimate the number of soft drink sales by container type [Table 3].

IV. Economic Consequences of the Deposit Regulation

The actions of bottlers and brewers, retailers, and consumers will determine the economic consequences of the regulation.

Effect on total demand. Although no one has estimated a demand curve for soft drinks or beer, some general observations can be made. First, demand for soft drinks appears to be relatively elastic with respect to income and relatively inelastic with respect to price. Or, to say the same thing, sales of soft drinks have increased somewhat more rapidly than income in recent years, and sales have increased despite rising prices. It therefore seems unlikely that the cost effects of the mandatory deposits (which, it is argued below, will be small in any event) will reduce sales noticeably. Second, beer sales have not increased in Illinois at anything like the rate in the United States. There has probably been some substitution of soft drinks for beer in relative terms, even though sales of both have increased. Becau the cost effects, small as they are, will be greatest for beer, which has a much larger proportion of its sales in non-returnables, the regulation may accelerate this substitution, leading to a somewhat smaller rate of growth o beer sales. Sales for 1971 will probably be somewhat higher than in 1970, but there is little advantage in making guesses concerning the increase. In the remainder of the report estimates of changes are based on the assumption that beverage sales and related industry sales and employment remain at 1970 levels.

TABLE 3

Estimated Sales of Beer and Soft Drinks, by Container Type, Illinois, 1962-1970

(billions of containers)

	Soft Drinks [a]					Beer [b]					
		Bottles					Bottles				
Year	Total	Total	Non-re-turnable	Return-able	Cans	Total	Total	Non-re-turnable	Return-able	Cans	Illinois % of U. S. [c]
1970	2.7	1.9	.5	1.5	.7	2.1	1.0	.4	.6	1.1	5.80 [e]
1969	2.7	2.0	.4	1.7	.7	2.0	1.1	.4	.7	1.0	5.87
1968	2.3	1.7	.3	1.5	.6	1.9	1.0	.4	.6	.9	6.01
1967	2.2	1.8	.2	1.6	.4	1.9	1.1	.4	.7	.9	6.23
1966	2.1	1.8	.1	1.7	.3	1.8	.9	.3	.6	.8	6.42
1965	2.1	1.9	.1	1.8	.2	1.7	1.0	.3	.7	.7	6.57
1964	1.9	1.8	[d]	1.7	.2	1.7	1.0	.3	.7	.7	6.67
1963	1.8	1.7	[d]	1.7	.1	1.6	1.0	.3	.8	.6	6.71
1962	1.7	1.7	[d]	1.6	.1	1.6	1.0	.2	.8	.6	6.80

a. Estimated as 5.6 per cent of national totals as given in Table 1, based on Illinois' percentage of total United States shipments in 1967, Table 6.

b. Estimated by multiplying estimated United States sales, as given in Table 1, by Illinois' percentage of United States consumption given in this table.

c. Derived from The Brewing Industry in the United States, Brewers Almanac, 1970, United States Brewers Association, Inc., Washington, D. C., 1970, Table 42, p. 56.

d. Less than 100 million.

e. Estimated by the author.

Conceivably, bottlers might continue to offer non-returnables, retailers might carry, and consumers might buy non-returnables in about the same proportions after the regulation as they do today, but this seems an unlikely outcome. National brand beer and soft drinks will cost more in non-returnables than in returnables with the deposit included in both. There is almost no advantage to be gained by the consumer in buying the higher priced non-returnable which would justify his spending several cents more per container. Thus a shift toward the returnable system seems likely.

Nevertheless, there are other possibilities. In British Columbia, retailers apparently abandoned national brands and emphasized house-brands in cans when a deposit regulation was imposed. The situation is hardly comparable to that in Illinois, however. The principal retail chain in British Columbia had a much larger share of the market than any one chain has in Illinois and was, therefore, less subject to competition than an Illinois retailer. Moreover, the motivation for the British Columbia retailer was different from the situation of the Illinois retailer. The British Columbia retailer wished to avoid handling containers in the store and supported an off-site redemption center system in which the national brand bottlers refused to participate. Had the retailer continued to carry national brands it would have been required to redeem them in the store. Moreover, the deposit in British Columbia was only $.02, so that the price of the house brand plus deposit was not as high as national brand returnables or cans. In this instance it seems likely that the regulation may have led to an increase in the consumption of beverages in non-returnables.

The situation in Oregon seems to be closer to what could be expected in Illinois. Faced with a forthcoming deposit regulation, retailers announced that they will not carry national brands in non-returnables, but will carry house brands in cans and national brands in returnables. For soft drinks, at least, this seems likely to be the outcome. House brands are cheaper than national brands because there is little advertising expense. If there is in fact a considerable demand for nonreturnables, then consumers may be willing to switch brands in order to obtain cans at prices close to those of similar national brands in returnables.

The Illinois regulation will require retailers to provide onsite redemption of all containers sold. There is little advantage to the retailer's excluding national brand non-returnables if consumers are willing to buy them since he must establish can disposal facilities anyway. The willingness of retailers to carry non-returnables will depend purely on the consumers' willingness to pay a premium for the particular container. As it is today, of course, consumers pay a considerable premium for beverages in cans over those in bottles.

All in all, it seems likely that national brand soft drinks in cans will decrease sharply as a result of the regulation, house brands may actually increase somewhat, non-returnable bottles will largely disappear, and returnable bottles will increase their share.

For beer, the situation is even more hazy. There may be a substantial shift to returnables by local brewers, but premium national brands may go even more to non-returnables than today. Overall, however, there probably will be a tendency toward returnables since price influences consumer choice in this market.

Another possible factor both in beer and soft drinks is a greater emphasis on large containers. The advent of the resealable closure increases the convenience of this container, the container cost is relatively less than in small sizes, and there are advantages in handling and cooling the larger container. At present, the price per ounce of soft drinks in quart containers is not very much less than in the smaller sizes, but promotion of the containers and a little shading of present mark-ups might substantially improve its market penetration. Beer is considerably cheaper in quarts than in smaller sizes. The quart container might even survive in non-returnable form.

Costs to retailers. If some non-returnables persist in the market, many of them will be returned for deposit. For example, about one-third of the soft-drink cans sold in British Columbia were being returned, even though the deposit is only $.02. The economics of redemption for the retailer depend closely on the proportion of non-returnables which are returned. If consumers discard a large proportion of the non-returnables they purchase and these are not redeemed by other people, then the forfeited deposits will either mean higher profits for retailers or they will be shifted forward to consumers in the form of lower prices. If the retail industry is reasonably competitive, as it appears to be, then the shift forward is the most likely outcome. If none of the non-returnables were redeemed, an unlikely outcome, the retailer could reduce his price by the full $.05 and thus offer the non-returnable plus deposit at the same price as before the regulation. If non-returnables are returned, however, the retailer will incur the cost of redeeming and disposing of the containers, and this cost will also be passed forward in a competitive market. If it costs a retailer $.01 to handle a return and the deposit is $.05 it is easily seen, by the following equation:

$$\text{Profit} = .05N - .01R$$

(N is the number of containers not returned, R is the number returned, and N + R = Total Sales) that the retailer breaks even if as many as five-sixths of his sales of non-returnables are returned. If less than five-sixths are returned, he makes a profit. If his cost of handling is less than $.01 he can make a profit with an even larger proportion of returns. No one really knows what proportions of non-returnables will be redeemed, nor what redemption will cost retailers. One estimate suggests a cost of $.01 to $.016 a bottle for handling each returnable bottle [7]. If the total volume of non-returnables in 1970 were replaced by returnables, the total cost to retailers would be $27 million. Retailers would pay much less for the soft drinks and beer purchased from manufacturers. This cost reduction should approximate $100 million.

Cost to bottlers. A complete shift to returnables would increase some costs for bottlers and reduce others. Labor costs are somewhat higher in delivering and picking up returnables. One downstate bottler paid a commission of $.13 a case to drivers for non-returnables, $.115 for returnables, and $.05 a case for empty returnables [1]. He reported his labor costs other than delivery to be about the same for returnables and non-returnables and paid his drivers fixed base salary per week in addition to the commission. A large brewer in an adjacent state reported his total handling and delivery cost for

returnables was about $.15 a case greater than for non-returnables [2]. The brewer, of course, would be expected to have somewhat higher costs because of the longer haul, but the cost range between $.035 and $.15 for a case of returnables probably reflects important differences in cost accounting as well as actual labor costs. Despite these differences, these figures are used in the analysis of employment effects.

In addition to the labor costs, bottlers and brewers would have additional costs for transportation because returnables are considerably heavier than non-returnables and a truck will carry more cases of non-returnables.

Moreover, bottlers and brewers would face significant capital losses from canning lines rendered useless. The transportation costs other than labor and these capital losses are important to these firms but they are not considered in this analysis which is limited to employment issues.

Reduced sales of container manufacturers. Using average prices collected in the Illinois beverage price survey and the estimated sales by container type in Illinois, it is possible to estimate total spending of Illinois consumers on beverages and how much of it is accounted for by container costs [Table 4]. Of course, many beverage sales are made at other, usually higher, prices, but the additional cost usually reflects a cost of service and can be reasonably excluded from the reckoning without doing any real harm to the analysis.

The estimated total arrived at this way comes to $827 million, based on supermarket prices, of which $135 million represents container costs [Table 4].

To make the cost analysis of the conversion to returnables under the regulation, it is assumed that the shift is a complete shift. While this almost certainly will not occur, it is useful to approach the problem in this way as it estimates extreme effects, and, at the same time, permits estimation of the costs and benefits.

A complete shift to returnables would lead to a reduced outlay of $101 million in the cost of containers taking account of the cost of replacing these containers with returnables at the assumed trippages [Table 5]. For retailers, sales would be $756 million after a complete shift to returnables, representing a reduction of $101 million in container costs and an increase of $30 million in the costs of handling returns. Trippage might decrease considerably in the event of a major shift to returnables, and this would increase the costs of the returnable system. For instance, consumers who previously bought returnables would probably continue to do so after the regulation, and the trippage of these bottles would probably increase. But trippage for this group is already rather high, indicating that about 95 per cent of bottles are returned. Those consumers who bought non-returnables before the deposit regulation would be forced to buy returnables under the assumption of a complete shift to returnables, and the have already expressed their willingness to pay a premium in order that they need not return the container. No doubt they would return some of their containers (or scavengers would return some for them), but it is doubtful that they would return as high a proportion as those persons who formerly chose the returnables. If the trippage of bottles bought by the former non-returnable customers were low enough, it

TABLE 4

Estimated Sales of Beverages at Super Market Prices, Illinois, 1970

	Number of units (billions)	Unit price (cents)	Sales (millions)	Cost of container (cents)	Total cost containers (millions)
Beer					
Returnable bottle (12 oz)	.6	20.0	120.0	.0061 [a]	3.6
Non-returnable, bottle (12 oz)	.4	20.9	83.6	.03	12.0
Can	1.1	21.6	237.6	.049	53.9
Total	2.1		441.2		
Soft drink					
Returnable bottle (16 oz)	1.5	12.8	192.0	.0081 [b]	12.0
Non-returnable bottle (16 oz)	.5	16.5	82.5	.0388	19.4
Can	.7	15.9	111.3	.049	34.3
Total	2.7		385.8		65.7
Total Beverage	4.8		827.0		135.2

a. based on trippage of 20.

b. based on trippage of 16.

Source: Tables 2 and 3.

Table 5

Beverage Sales and Container Cost for a Complete Shift to Returnables

	Number (billions)	Price (cents)	Sales (millions)	Container Cost Unit (cents)	Container Cost Total (millions)
Beer	2.1	20.0	410.0	.0061	12.2
Soft drinks	2.7 [a]	12.8	345.6	.0081	21.9
Total	4.8		755.6		34.1

a. No adjustment is made for the replacement of 12 oz. cans by 16 oz. bottles.

Source: Derived from tables 2 and 3.

could offset any increase in trippage for the former returnable customers with the result that overall trippage would decline.

The saving in outlay enjoyed by consumers is not a pure saving, for there are offsetting losses to those consumers who have bought non-returnables for their convenience. The simple fact that some consumers buy non-returnables when they could have bought returnables shows that they value the convenience. Critics of non-returnables will view the cost of the non-returnables as far in excess of the value of the convenience, but most economists would argue that insofar as the consumer had a choice of buying or not buying non-returnables, he expressed his valuation of the convenience when he bought it. To those economists, the cash saving to consumers is exactly offset by the value of the convenience of which consumers were deprived. Some would go farther and argue that consumers have been deprived of or had to pay more for what they formerly purchased, and, therefore, the loss they experienced exceeded their cash saving.

Whatever the costs to consumers, they will devote most of the savings from reduced cash outlay to purchases of other commodities.

In addition to the reduced outlay generated by the shift to returnables, there will be costs for at least those consumers who do not return their containers for redemption.

Are forfeited deposits a cost to consumers? Suppose consumers continue to purchase 4.8 billion units of beer and soft drinks after the deposit regulation is imposed. At $.05, this represents an annual total deposit of $240 million, but not all of this will be outstanding at any one time since consumers will return containers for redemption. For example, suppose 80 per cent of all containers are redeemed, representing forfeited deposits of $48 million. This is an obvious cost to those persons who do not return the containers, but, as pointed out above, the retention of the forfeited deposits for non-returnable containers represents either higher profits for retailers or is shifted forward to consumers in the form of lower prices. Forfeited deposits on returnable bottles will usually be shifted back to the bottler. In either instance, the deposits forfeited by consumers will, in competitive markets, result in lower prices than would have prevailed had the deposit not been paid. For non-returnables, of course, no significant social cost (other than disposal cost) is created by the failure to return a container which could not be reused or did not possess a significant value as scrap. Thus the forfeited deposits for non-returnables represent a pure transfer payment from those consumers who don't return the containers to retailers or to all consumers. For returnables, however, the failure to return the bottle does represent a social cost, since it must be replaced by another, but in this case the deposit simply serves to internalize the costs in the part of the market which is most nearly responsible for the cost, rather than diffusing it over all consumers as is the case when a very low deposit is imposed. Moreover, if the larger deposit is effective in increasing trippage of returnables, there will be a reduction in social cost as a direct result of the imposition of the deposit. This result represents an additional benefit of the regulation.

The forfeited deposits are a cost for those who make the decision not to redeem the containers, but it is offset exactly by benefits to retailers and

bottlers. In a competitive market the cost will largely be shifted forward to consumers as a class (incidentally reducing the net cost to those who do not redeem their bottles). Because the market does not consist of two distinct classes of consumers -- those who do and those who don't -- it seems quite likely that the net costs to most groups of consumers will be quite small, and to consumers as a group, negligible. Moreover, these costs are readily avoided by anyone who wishes to avoid them. He need only redeem his containers.

To summarize this section, the following points suffice:

(1) total sales of beverages are unlikely to be reduced very much below the level that would have prevailed without the regulation.

(2) benefits to consumers in the form of reduced unit prices of beverages in the event of a complete shift to returnables would amount to about $71 million.

(3) consumer savings will be spent on other consumer goods.

(4) the shift to returnables is unlikely to be complete.

(5) retailers will incur increased costs of handling containers which may amount to $27 million in the event of a complete shift to returnables.

(6) bottlers and brewers will incur increased labor costs at the rate of a fraction of a cent per unit, but a reduction in purchases of containers of about $100 million.

(7) container manufacturers will experience a reduction in container sales of about $100 million.

The next section considers the detailed cost and employment effects arising from the shift to returnables.

V. Employment Effects of the Deposit Regulation

The effects on employment of a complete shift to returnables are estimated in this section. This approach permits measurement of the maximum effects on displacement. Such a shift is not to be expected, and the effects of any specific shift, such as 50 per cent or 75 per cent can be made by taking the appropriate proportion of the effects estimated here.

A complete shift to returnables would lead to an increase in total employment rather than a decrease according to the estimates presented here. The reason is the high labor intensiveness of the returnable system. This result is true even if the employment created by the diversion of consumer expenditures to other goods is ignored. However, these offsetting expenditures and employment effects should not be ignored.

Employment Reductions. To estimate the direct effect of the assumed complete shift to returnables, the estimated reductions in sales of containers are applied to total shipments of the industry to determine the proportionate reduction. The same proportionate reduction is then applied to total employment in the industry to estimate the implied reduction. For 1970 the following reductions were estimated in Tables 4 and 5 above:

	Change in Sales-Millions of Dollars		
	Beer	Soft Drink	Total
Reduction in can sales	-53.9	-34.3	-88.2
Reduction in non-returnables bottle sales	-12.0	-19.4	-31.4
Increase in returnable bottle sales	8.6	9.9	18.5
Net change in bottles	- 3.4	- 9.5	-12.9
Net change in container sales	-57.3	-43.8	-101.1

A reduction of $88.2 million of can sales represents a 2.4 per cent reduction in total national sales of cans [Table 6]. If employment in the metal can industry were reduced proportionately there would be a reduction of 1,605 workers [Table 7].

A net reduction of $12.9 million of bottle sales would be about 0.8 per cent of total national glass container sales. If employment were reduced proportionately in this industry, there would be a reduction of about 554 workers.

The reductions represent a significant fraction of Illinois employment in these industries. The 1,605 metal can workers represent about 16.7 per cent of Illinois employment in the industry, and the 554 glass container workers represent about 5.2 per cent of Illinois employment in the industry. Because these industries are heavily concentrated in Illinois, it seems likely that a very large proportion of the reductions in can and glass container employment induced by a complete shift to returnables would occur in Illinois.

Another direct effect of a complete shift to returnables is the expected decrease in litter collection and solid waste disposal costs of about $3.3 million. Such a reduction concentrated entirely in labor costs would represent about 550 workers if such workers earned about $6,000 a year.

In addition to these direct effects of the mandatory deposit regulation, there will be indirect effects caused by the reduction of purchases by the directly impacted industries.

TABLE 6

Value of Shipments and Value Added by Manufacture in Selected Industries Related to Beer and Soft Drink Manufacture and Sales, United States and Illinois, 1968-1969
(millions of dollars)

Year	Source	Glass containers 3221	Metal cans 3411	Beer wholesalers 5095	Malt liquors 2082	Bottled and canned soft drinks 2086	Glass containers 3221	Metal cans 3411	Beer wholesalers 5095[a]	Malt liquors 2082	Bottled and canned soft drinks 2086
1969	ASM	1,664.7	3,620.7		3,418.5	4,065.7					
1968	ASM	1,407.3	3,332.1		3,160.5	3,574.7					
1967	Census	1,352.4	2,890.6	4,990.4	2,929.7	3,173.2	196.5	349.1	340.6	153.8[b]	178.2
1966	ASM	1,207.5	2,631.3		2,699.9	2,734.9					
1965	ASM	1,091.8	2,395.0		2,497.2	2,505.4					
1964	ASM	1,055.9	2,255.7		2,469.8	2,408.8					
1963	Census	1,004.5	2,075.0	3,748.6	2,315.1	2,210.9			293.2		
1962	ASM	987.6	2,112.4		2,282.0	2,030.9					
1961	ASM	967.4	2,095.3		2,200.0	1,911.4					
1960	ASM	939.2	1,936.4		2,179.5	1,806.1					
1959	ASM	915.6	1,933.7		2,095.4	1,714.4					
1958	Census	862.1	1,824.1		1,982.7	1,558.3					
Value added by manufacture											
1967	Census	842.2	1,141.5			1,679.4	121.4	151.9		69.2[b]	94.2
1963	Census	629.6	830.5			1,233.6	102.9	140.4		62.9	69.8

a. Only that part of the Beer, wine, distilled alcoholic beverages industry related to beer and ale.

b. SIC 2082, 2083, and 2084 combined.

Source: U. S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1958, 1963, and 1967; Annual Survey of Manufactures, 1959, 1960, 1961, 1962, 1964, 1965, 1966, 1968, 1969; Census of Business, Vol. 3, 1967.

TABLE 7

Estimated Employment in Selected Industries Related to Beer and Soft Drink Manufacture and Sales, United States and Illinois
1968-1970
(thousands of workers)

		United States					Illinois				
SIC Code / Year	Source	Glass containers 3221	Metal cans 3411	Beer whole-salers 5095	Malt liquors 2082	Bottled and canned soft drinks 2086	Glass containers 3221	Metal cans 3411	Beer whole salers 5095[a]	Malt liquors 2082	Bottled and canned soft drinks 2082
1970[b]	CBP	68.9[b]	65.9	101.9	56.3	124.6	10.3	9.6[c]	7.0	2.1	6.1
1969[b]	CBP	69.2[b]	63.9		57.2	122.7	11.6	9.7[c]		2.2	6.1
1969	ASM	71.5	68.1		58.1	128.6					
1968	ASM	63.9	63.1		59.8	125.2					
1967	Census	66.7	60.3		59.6	123.3	10.0	10.4		2.8[d]	6.3
1966	ASM	64.5	58.7		60.5	117.7					
1965	ASM	61.5	54.9		60.4	113.9					
1964	ASM	60.4	55.1		61.9	111.1					
1963	Census	60.0	53.2		62.6	106.8	9.2	10.1		5.4	5.2
1962	ASM	60.0	53.1		66.0	105.4					
1961	ASM	60.2	53.4		68.2	104.1					
1960	ASM	58.5	53.6		69.8	103.3					
1959	ASM	56.2	53.8		70.9	100.0					
1958	Census	54.9	54.9		71.7	97.1					

a. Total. Not comparable to industry in Table 6.

b. County Business Patterns data based on mid-March covered FICA employment. Not comparable to Census and Annual Survey of Manufactures data.

c. SIC 341

d. SIC 2082, 2083, and 2084 combined.

Source: U. S. Department of Commerce, Bureau of the Census, Census of Manufactures, 1958, 1963, and 1967; Annual Survey of Manufacturers, 1959, 1960, 1961, 1962, 1964, 1965, 1966, 1968, 1969; County Business Patterns, 1969 and 1970.

To estimate the indirect effects of the reductions in can and bottle sales, an input-output analysis of the industries has been carried out. For 1963 a detailed industry input-output table for the United States is available [11]. For any final product (such as metal cans in our analysis), the total requirement coefficients estimate the amount of input from any industry (such as blast furnace and basic steel products) required to produce a dollar of output delivered to final demand. For steel into metal cans, this coefficient is .53993, indicating that about $.54 of steel is used as input to every $1.00 of metal cans delivered to final demand. The total requirements coefficient includes both direct inputs of steel to metal cans and the inputs of steel to other industries' outputs used in the production of metal cans (such as railroads).

When the total requirements coefficients for the industries which supply significant inputs to the impacted industries are multiplied by the estimated reduction in can and bottle sales induced by a complete shift to returnables, estimated reductions in inputs to the can and glass container industries are obtained. These estimates are listed in Tables 8 and 9. To obtain estimates of employment reductions caused by the reduction in inputs to the can and glass container industries, the ratio of total employment to total shipments is estimated. When this ratio for each industry is multiplied by the corresponding reduction in demand, the estimated reduction in employment is obtained.

The indirect employment reductions resulting from a complete shift to returnables would be about 3,000 workers in the industries supplying the metal can industry and about 200 workers in the industries supplying the glass container industry. In making these calculations, only industries for which the total requirements coefficient was .01 or larger were considered. The effect of including the omitted industries would amount to at most another 100 or 200 workers and these would be widely distributed among the more than three hundred omitted industries. Not all of the reduction in employment estimated in this analysis would occur in Illinois. Illinois has no significant employment in many of the industries affected (such as the mining of iron ore). Lacking an inter-regional input-output model, it is impossible to estimate how many Illinois workers would be affected, but the estimates given are the maximum effects. The analysis was carried out on 1963 data (which is the most recent available). This old data certainly biases the estimates upwards, since labor productivity has increased in most industries in the past eight years. Thus, such errors of estimation as exist tend in the direction of overestimating rather than underestimating the Illinois employment effects.

Increases in Employment. The effect of a complete shift to returnables in increasing employment would be concentrated in retail trade, soft drink bottlers, and brewers and beer distributors. For retailers, it has been estimated that the cost of handling a single container return amounts to approximately $.01. Total costs of a shift from .6 billion containers of beer in returnables to 2.1 billion containers of beer in returnables would amount to approximately $15 million. For soft drinks, the shift from 1.5 billion containers of returnables to 2.7 billion containers of returnables would amount to $12 million. The total costs to retailers of $27 million is quite close to the additional costs to retailers of $30 million which can be derived from the estimated reduction in sales of $71 million and the estimated

TABLE 8

Total Requirements Coefficients, Shipments, Employment, Ratio of Employment to Shipments, Employment per Million Dollars of Metal Cans Delivered to Final Demand and Estimated Reduction in Employment Resulting from a Complete Shift to Returnables, Illinois, Selected Industries

Industry (SIC Code)	Input-Output Ind. No.	Total requ'ts coef.	Shipments ($million)	Employment[a] (thous.)	Employment per thousand dollars shipments	Employment per million dollars of demand	Total employment reduction
Coal mining (11,12)	7.0	.01709	2.636.8	149.0	.0565	.9656	85
Petroleum and gas (1311,2)	8.0	.01180	12,264.7	163.8	.0133	.1569	14
Paper mills (2611)	24.02	.01013	5,054.4	65.4	.0086	.2013	18
Paperboard mills (2631)	24.03	.01013	2,557.4				
Paperboard cont'rs (265)	25.00	.02421	4,748.3	189.7	.0400	.9684	85
Commercial printing (2751,2)	26.05	.04764	5,307.2	285.9	.0537	2.5583	226
Ind'l chemicals (281)	27.01	.03219	12,613.2	284.6	.0226	.7275	64
Paints (2851)	30.00	.03006	2,462.1	62.9	.0255	.7665	68
Petr. refining (2911,299)	31.01	.01728	20,858.5	188.8	.0091	.1572	14
Basic steel (331)	37.01	.53993	19,988.6	589.9	.0295	15.9279	1,405
Prim. aluminum (3334)	38.04	.01179	1,969.8	21.4	.0109	.1285	11
Alum. rolling (3352)	38.08	.01843	2,310.1	60.9	.0264	.4866	43
Railroads (40,474)	65.01	.03775	11,142.9	771.6	.0692	2.6123	230
Motor freight (42,473)	65.03	.02452	13,486.3	903.5	.0670	1.6428	145
Water transport (44)	65.04	.01115	5,033.9	302.2	.0600	.6690	59
Electric util. (491,pt.493)	68.01	.01912	15,427.1	246.2	.0160	.3059	27
Gas utilities (492,pt.493)	68.02	.01868	11,301.8	153.3	.0136	.2540	22
Wholesale trade (50)	69.01	.05826	48,440.3	3,104.0	.0641	3.7345	329
Credit agencies (61,67)	70.01	.02755	45,160.9	379.0	.0084	.2314	20
Misc. bus. serv. (73,769[4])	73.01	.01919	13,372.6	943.2	.0362	1.3948	123
Advertising (731)	73.02	.01934	12,698.7				

a. Employment industry may differ slightly from Input-Output Industry by inclusion or exclusion of small three or four-digit industries.

Sources: Total Requirements Coefficients, Shipments: U. S. Department of Commerce, Office of Business Economics, Input-Output Structure of the U. S. Economy: 1963, Vol. 3, U. S. Government Printing Office, 1969.

Employment: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, United States, 1909-70, Bulletin 1312-7, U. S. Government Printing Office, no date.

TABLE 9

Total Requirements Coefficients, Shipments, Employment, Ratio of Employment to Shipments, Employment per Million Dollars of Glass Containers Delivered to Final Demand and Estimated Reduction in Employment Resulting from a Complete Shift to Returnables, Illinois, Selected Industries

Industry (SIC Code)	Input-Output Ind. No.	Total requ'ts coef.	Shipments ($million)	Employment[a] (thous.)	Employment per thousand dollars shipments	Employment per million dollars of demand	Total employment reduction
Stone & clay mining (141,etc)	9.0	.02581	2,024.1	81.5	.0403	1.0401	13
Petroleum and gas (1311,2)	8.0	.01180	12,264.7	163.8	.0133	.1569	14
Paperboard mills (2631)	24.03	.03976	2,557.4	20.0	.0078	.3101	4
Paperboard cont'rs (265)	25.00	.10465	4,748.3	189.7	.0400	4.1860	54
Ind'l chemicals (281)	27.01	.12919	12,613.2	284.6	.0226	2.9200	38
Petr. refining (2911,299)	31.01	.02387	20,858.5	188.8	.0091	.1572	3
Abrasive prod. (3291)	36.16	.01939	744.8	23.4	.0314	.6088	8
Motor freight (42,473)	65.03	.02047	13,486.3	908.5	.0670	1.3715	18
Electric util. (491,pt.493)	68.01	.02421	15,427.1	246.2	.0160	.3059	5
Gas utilities (492,pt.493)	68.02	.06352	11,301.8	153.3	.0136	.2540	11
Wholesale trade (50)	69.01	.03516	48,440.3	3,104.0	.0641	2.2538	29
Credit agencies (61,67)	70.01	.02663	45,160.9	379.0	.0084	.2237	3
Misc. bus. serv. (73,7694)	73.01	.02033	13,372.6	943.2	.0362	1.1055	14
Advertising (731)	73.02	.01221	12,698.7				

a. Employment industry may differ slightly from Input-Output Industry by inclusion or exclusion of small three- or four-digit industries.

Sources: Total Requirements Coefficients, Shipment: U. S. Department of Commerce, Office of Business Economics, Input-Output Structure of the U. S. Economy: 1963, Vol. 3, Washington, D. C.: U. S. Government Printing Office, 1969.

Employment: U. S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, United States, 1909-70, Bulleting 1312-7, Washington, D. C.: U. S. Government Printing Office, no date.

reduction in container costs of $101 million. Consumer savings are only about 70 per cent of the total reduction in sales of containers, the balance representing the costs to retailers of handling the returns.

Assuming that the unskilled labor employed to handle bottle returns is paid $2.00 an hour or about $4,000 a year, the $27 million of retailer costs represents an increase in employment of about 6,750 workers.

The estimated additional costs of the returnable system to bottlers is about $.0015 per returnable, representing additional total costs to bottlers of about $1.8 million. Most of this cost represents additional employment of driver-salesmen. At an annual wage of $15,000 this represents an increase of about 120 workers. This estimate is perhaps low because it is based on data from one bottler and is much below the additional unit costs experienced by the brewer considered in this study.

For brewers and beer distributors, the additional costs of returnables are estimated at $.00625 per bottle, so the increase of 1.5 billion returnables represents increased costs of $9.4 million. At an annual wage for drivers of $15,000, this amount represents an increase of about 627 workers.

Most of the increased employment effects in retail trade and soft-drink bottlers will be local Illinois effects. Some of the increased employment for brewers and distributors will be outside of Illinois.

The employment reductions and increases resulting from a complete shift to returnables can be summarized as follows:

Reductions in employment	
Metal cans	1,605
Glass containers	554
Litter collection and waste disposal	550
Indirect employment effects from metal cans	2,988
Indirect employment effects from glass containers	214
Total reductions	5,911
Increases in employment	
Retail trade	6,750
Soft-drink bottlers	120
Brewers and beer distributors	627
Total increases	7,497
Net increase in employment	1,580

In addition to these effects, about $71.4 million of consumer expenditures will be diverted to other consumer goods from beverages. This represents about .007 per cent of GNP. This expenditure would induce about 5,000 additional jobs in the consumer industries and those which furnish inputs to consumer industries. Thus the total employment effects of the mandatory deposit regulation and a complete shift to returnables should be about 6,600 additional jobs.

VI. Summary and Conclusions

The previous section indicates that the deposit regulation will increase employment by about 6,600 jobs if there is a complete shift to returnables. There is little reason to expect that the shift will be complete, but there will probably be a substantial shift toward returnables. Such a partial shift will reduce the employment effects of the regulation, and, at the same time, reduce the pressure on the heavily impacted industries. It was not possible to estimate with any precision the location of the disemployment effects. It is likely that nearly all of the direct reductions will occur in Illinois and one-half or more of the indirect effects as well. Except for the metal can industry, the reductions are relatively small in relation to total employment in the industry.

No one would ignore a 5 per cent reduction in glass bottle employment, but this industry has a voluntary quit rate of close to 2 per cent per month according to the Bureau of Labor Statistics, and this suggests that the required reduction in employment could be absorbed through normal quits in no more than three months. This is particularly true in that the immediate impact would be substantial stocking up by bottlers of returnable bottles as they shifted to the returnable system. The immediate impact of the regulation might well be an increase in employment in glass containers. Later, however, there would probably be a decline to a lower level as demand fell back to replacement rates.

The situation is much less simple for the metal can industry. The quit rate in metal containers is much lower than in glass containers, about 1 per cent a month rather than 2 per cent. The much larger proportionate employment effect of 17 per cent would require more than a year to absorb through voluntary quits. This fact suggests that some delay in the imposition of the regulation would ease the necessary employment adjustment. With the less than complete shift to returnables which can be expected and a period of nine months or a year over which bottlers could prepare to shift to returnables, the impact on metal can sales would be less sudden.

While there is an increase in employment to be expected as a result of the regulation, it must at the same time be recognized that workers in metal cans, steel, and glass containers face the risk of some injury. Transitions are seldom smooth and there will unquestionably be some layoffs in these industries resulting from the adoption of the regulation. Fortunately, many of the workers in the industries are members of effective trade unions which have negotiated supplemental unemployment benefit programs which will sharply reduce the income loss effects of any necessary displacement.

The economic costs and benefits of the employment changes are important components of the decision-making process on this question. The fact that some workers will be displaced and that many new jobs widely distributed across the state will be created are quite worth noticing, but it is not necessary to stress these adjustments too much. The changes induced by adoption of the regulation will not be sudden but will take place at a pace which will allow adjustments to be made by firms and workers. The labor market is likely to improve during the next few years as the nation recovers from the most recent recession. The process of redistribution of employment among economic activities is a normal part of economic development and the changes which are likely to occur in this instance are not particularly large in terms of adjustments which normally occur

References

1. Anonymous bottler.

2. Anonymous bottler.

3. Beverage Containers, Recommendations of the Illinois Solid Waste Management Task Force. Illinois Institute of Environmental Quality. Springfield, 1971.

4. Tom Joyce, Solid Waste - - Litter, Memorandum to the Task Force on Solid Waste Source Reduction. Illinois Institute of Environmental Quality, August 10, 1971.

5. Midwest Research Institute, The Role of Packaging in Solid Waste Management. Environmental Protection Agency, Bureau of Solid Waste Management. Washington, D. C.: U. S. Government Printing Office. 1969.

6. Sidney P, Mudd. Letter to Bernard C. Smith, chairman, New York State Senate Committee on Conservation and Recreation. May 24, 1971.

7. National Association of Food Chains. Testimony of Mr. Paul A. Karody, Jr., before Prince Georges County Maryland Council, November 2, 1971.

8. Bernard Udis, Editor. Adjustments of the U. S. Economy to Reductions in Military Spending. U. S. Arms Control and Disarmament Agency. Washington, D. C.: U. S. Government Printing Office. 1970.

9. United States Brewers Association, Inc. The Brewing Industry in the United States, Brewers Almanac, 1970. Washington, D. C. 1970.

10. U. S. Department of Commerce, Bureau of the Census. Census of Business. Vol. III. Washington, D. C.: U. S. Government Printing Office.

11. U. S. Department of Commerce, Office of Business Economics, Input-Output Structure of the U. S. Economy: 1963, Vol. 3.

Paper No. 2

EMPLOYMENT EFFECTS OF A BAN ON NONRETURNABLE BEVERAGE CONTAINERS IN MINNESOTA

ABSTRACT

A ban on nonreturnable containers will have significant employment effects on the soft drink and beer industries in Minnesota.

This report attempts to identify the economic effects and to measure the impact of a ban on consumer costs and employment in Minnesota. The methods followed correspond closely to that in the previous study of the employment effects of mandatory deposit regulations made for Illinois [1], but somewhat better data and industry information has been available for this study.

Most of the conclusions reached in this study would also apply to a mandatory deposit law which did not ban nonreturnables. The Illinois analysis, for instance, was based on the assumption that mandatory deposits would lead to an essentially complete shift from nonreturnables to returnables. The degree of such a shift, however, is open to argument, and it can be expected that nonreturnables would persist in some sales situations despite the imposition of a mandatory deposit.

I. Expenditure Flows and Employment

The analysis is based on the changes in employment that result from changes in the flow of expenditure. The underlying principles are quite simple:

1. A decrease in the sale of beverage in one-way containers resulting from a ban leads to reduced labor demand for production and distribution, which are termed "the direct negative employment effects."
2. A decrease in sales leads to reduced demand for inputs to the production process, which in turn leads to reduced labor demands in the industries supplying the inputs. These employment effects are termed "indirect negative employment effects."
3. A decrease in consumer spending on beverages in one-way containers permits consumers to spend more on purchases of other commodities generating a stream of positive direct and indirect effects arising from production and sale of the new commodities purchased.
4. If consumers do not spend the same amounts in aggregate before and after the ban, the reduction or increase in consumer spending will lead to negative or positive employment effects which are termed "induced employment effects."

In the following analysis it is assumed that consumers continue to spend the same amount before and after the ban on beverages and other products, hence, there are no induced spending effects. This is a reasonable assumption since beverages in cans and nonreturnable bottles have very close substitutes in the corresponding beverages in returnable bottles. Moreover, beverages are a relatively small proportion of all consumer spending, hence, the change in packaging systems should not have a large aggregate effects.

As a general proposition, the assumption of no change in spending requires that aggregate national wages will not change as a result of a ban in one state, but employment may change. It may increase, for instance, if spending is diverted from high-wage industries to low-wage industries. Employment and wages within the state may change as well, if the ban leads to a substitution of local production, distribution, and sales employment for out-of-state employment the result could be increase in employment and wages in the state.

The principal questions involved are the (1) the effects of a ban on total sales of beverages; (2) the employment generated in Minnesota in the nonreturnable beverage and container industry before and after a ban; and (3) the effects of the ban on the sale of national brand out-of-state beers and nationally canned controlled-label soft drinks canned out-of-state.

I. Expenditure Flows and Employment

The analysis is based on the changes in employment that result from changes in the flow of expenditure. The underlying principles are quite simple:

1. A decrease in the sale of beverage in one-way containers resulting from a ban leads to reduced labor demand for production and distribution, which are termed "the direct negative employment effects."
2. A decrease in sales leads to reduced demand for inputs to the production process, which in turn leads to reduced labor demands in the industries supplying the inputs. These employment effects are termed "indirect negative employment effects."
3. A decrease in consumer spending on beverages in one-way containers permits consumers to spend more on purchases of other commodities generating a stream of positive direct and indirect effects arising from production and sale of the new commodities purchased.
4. If consumers do not spend the same amounts in aggregate before and after the ban, the reduction or increase in consumer spending will lead to negative or positive employment effects which are termed "induced employment effects."

In the following analysis it is assumed that consumers continue to spend the same amount before and after the ban on beverages and other products, hence, there are no induced spending effects. This is a reasonable assumption since beverages in cans and nonreturnable bottles have very close substitutes in the corresponding beverages in returnable bottles. Moreover, beverages are a relatively small proportion of all consumer spending, hence, the change in packaging systems should not have a large aggregate effects.

As a general proposition, the assumption of no change in spending requires that aggregate national wages will not change as a result of a ban in one state, but employment may change. It may increase, for instance, if spending is diverted from high-wage industries to low-wage industries. Employment and wages within the state may change as well, if the ban leads to a substitution of local production, distribution, and sales employment for out-of-state employment the result could be increase in employment and wages in the state.

The principal questions involved are the (1) the effects of a ban on total sales of beverages; (2) the employment generated in Minnesota in the nonreturnable beverage and container industry before and after a ban; and (3) the effects of the ban on the sale of national brand out-of-state beers and nationally canned controlled-label soft drinks canned out-of-state.

II. Effect of a Ban on Beverage Sales

There is little experience to draw on in other states concerning the effect of a ban on one-way containers on total beverage sales. Oregon's law requiring a mandatory five cents deposit on all beverage containers and banning the pull tab has only been in effect since October 1, 1972, and there is no report available of its effects on soft drink sales. Beer sales in November and December were higher for 1972 than for the same months in 1971, according to William Moore, assistant director of inventory enforcement for the Oregon Liquor Commission [2]. October 1972 sales were 50 percent higher than October 1971 (probably because of inventory building of returnables), while for the first eleven months of 1972 sales were 6.6 percent higher than in the corresponding period of 1971, according to Mr. Moore. Since Mr. Moore reports that very few drinks are being sold in cans, the Oregon situation may be though comparable to what would happen in the event of a ban.

Such demand estimates for beer and soft drinks as have been made suggest that demand is price inelastic [3], i.e., that a one percent increase in price would lead to only a 0.2 percent decrease in sales. Since beverages packaged in returnable bottles are close substitutes for beverages packaged in one-way containers, one would expect at most a small decrease in sales even if consumers treated deposits as part of the price and if the sale price excluding deposit even increased slightly. It is argued below that retail prices for beverages in returnables are not likely to increase because of the ban, but even if they did increase as much as ten percent, the predicted decrease in sales would only be 2 percent. Sales of beer and soft drinks have been increasing at rates of 5 to 7

percent per year nationally in recent years as consumers substituted these goods for coffee and other beverages, so the assumption made in this study that a ban would not lead to a decrease in sales is probably a reasonable one. It is more likely that beverage sales would increase after a ban, just as beer sales in Oregon increased after a mandatory deposit regulation was imposed.

Market structure in beverage markets is best described as "monopolistic competition." In such markets a firm has some control over the price it charges, unlike the purely competitive firm, but it does not have complete control, like the monopolist. Each firm in such markets strives to differentiate its product by advertising, distinctive and convenient packaging, or other means. At the same time the firm tries to increase its market share by luring away the customers of competing products by imitating their flavors or packages. Some firms are content with lower prices than others and forgo extensive advertising and package variations. It is natural for firms in such markets to believe that the variety of packages and sizes is essential to its sales, for if it restricted itself to a single package type and size in the current marketplace it could expect to lose a major part of its market.

What is perhaps true for a single firm, however, is probably not true for the market as a whole. Many beverage firms act as if the consumer was buying a container and not the beverage it contains, but if no firm can offer the particular container because of a ban the consumer must buy the beverage in the container that is available or switch to unpackaged beverages. The fears of the industry that a ban will lead to an 8 percent decline in sales are absurd [4]. Even strongly biased consumer surveys indicate only a 2 percent reduction [5].

These questions cannot be settled by a priori arguments, and the assumption that there would be no change in beverages sales volume the year after a ban is a conservative one considering the steady and rapid recent growth of soft drink and beer sales.

III. Effect of a Ban on Prices

It is sometimes agreed that a shift to returnable would lead to increased prices for returnables. This could occur as a result of any of three situations:

1. a decrease in bottle trippage
2. higher retailer and producer costs
3. lower profit margins on returnables than nonreturnables (i.e.,"current subsidy" to returnables by bottlers, brewers, distributors or retailers)
4. changes in brand mix
5. capital losses on equipment

Lower trippage. If consumers continue to discard containers when only returnable are available, trippage, of course, would decrease and the cost of the returnable system would increase. There is no reason to expect trippage to decrease or that portion of sales which has been in returnables. If anything, trippage should increase with higher desposits and better return facilities. The real question lies in the behavior of persons who have used one-way containers who now must shift to returnables. This is simply a matter of behavior, and behavior can be influenced. Once committed to the returnable system, bottlers and brewers, environmentalists, and agencies concerned with solid waste and litter all have a common interest in making the returnable system work efficiently. The same effort devoted to making the returnable system work as is devoted to cleanup and recycling campaigns would probably make the returnable system quite successful because , with deposits, substantial economic incentive works together with public interest.

The deposit can be expected to provide incentives for the purchasers to return bottles, and for scavengers and bottle collection drives to gather containers from those consumers who do not wish to return them themselves.

The consumer sometimes purchases one-way containers because it is the only available container for the brand desired. Many major outlets for beer and soft drinks do not handle returnables at all, so the consumer has no choice, and his action in buying one-way containers does not imply a willingness to pay a premium to discard containers. The frequency with which consumer surveys show approval of bans or mandatory deposits suggests that the "convenience" of the one-way container is a convenience many consumers can do without.

The effect of a ban is not an obvious decline in trippage as is sometimes argued, but may be no change or even a substantial increase in trippage.

Higher producer or distributer costs. Major national brand soft drinks and those beers already returnable are not likely to face higher packaging costs. For out-of-state and imported brands, however, this can be a problem. Imported and remotely bottled beers, for instance, would probably choose to use a standard "multibrewer" returnable bottle which would not be returned to that brewer. The distributer would handle redemptions and return these bottles to domestic brewers. If this were done, the imported beers would probably experience a reduction in price rather than an increase. The return of these bottles would more than compensate the distributor for any increased price to him arising from use of the multibrewer bottle.

Similarly, out-of-state brewers would be forced to handle returns which, with long hauls, would be relatively expensive in terms of transportation costs which are higher for returnables than nonreturnables. But returnable beer bottles are cheaper than cans and almost as cheap as one-way bottles. It is hard to see that wholesale prices would have to increase very much even if no bottles were returned.

If out-of-state and imported beer were shipped in multibrewer returnables, local brewers would have a supply of used returnables, since distributers would often prefer to channel returns to local brewers.

Since brewer or distributer trucks must return to breweries anyway, neither the return trip nor loading costs have differential cost implication for out-of-state brewers. Nevertheless, transportation costs increase substantially with distance travelled. The growing concentration of brewing in a few major national firms has been permitted by the shift to one-way containers ; a forced shift to returnables would benefit local brewers in competition with remote brewers [6].

Lower markups on returnables. It is sometimes argued that brewer bottles and distributor profit margins are lower on returnables than on nonreturnables and that a shift to returnables would require higher wholesale prices on returnables than are currently charged if profit levels were to be maintained. This is to say that returnables are subsidized. It is difficult to see why brewers should subsidize returnables which they seem to be so eager to abandon. The lower wholesale prices of returnables probably reflect costs and selective price discrimination.

While good data on markups is lacking because of its confidential nature, it is clear that the cost to the brewer of beer in returnables is somewhat lower than for one-way containers [7], and that the same is true in soft drinks [8]. The differential is smaller at wholesale prices because of higher distribution costs of returnables, and is usually smaller still at retail because of higher handling, sales, and return costs for retailers.

There is little reason to believe that there is any consistent pattern of subsidizing returnables, since almost everyone in the production and distribution chain except some brewers and bottlers seems eager to get rid of the returnable system as soon as possible. The belief that the returnable system was doomed, which was widely held throughout industry until the past year, hardly contributed to significant research to speed up or economize on returnable bottle lines and equipment. Many bottlers and brewers have simply continued to use fully amortized returnable lines with little improvement while devoting capital expenditures to the rapidly improving "packaging systems of the future" which are almost uniformly one-way systems. With a revival of interest in returnable systems in those states which have instituted beverage container regulations and growing environmental concern elsewhere, it seems likely that substantial improvements in returnable bottle handling systems will be developed.

Certainly there is little reason to expect that bottlers and brewers will be forced to raise beverage prices because they have shifted to a cheaper packaging system. Some may try to do so, but there seems to be little economic justification for such actions.

Changes in brand mix. If a bottler or brewer faces a substantial rise in cost because of the ban, he may wish to raise his price. Unless sellers are faced with similar situations it is unlikely that the seller who wishes to raise his price will be able to do so without suffering a reduction in sales. Lower sales by a firm are likely to be caused by an increase in price rather than cause an increase in price. At the same time, the national brewers and controlled-brand soft drink firms may face substantially higher costs and be forced to raise prices and lose market shares. If this happens, then in most instances locally brewed and bottled beverages will replace them and average prices for beer and soft drinks as a whole should change very little. If there is a shift from national to local beers, the result may be a reduction in the average price of beer, (since national brands are usually more expensive). If there is a shift from controlled and local brand soft drinks, the result may be a slight increase in the all-brand average price of soft drinks since national brands in returnables are somewhat higher in price per ounce than controlled brands in cans, but a decrease could occur with a shift from local brands to returnables.

Overall, then, a change in brand mix is unlikely to change average beer and soft drink prices very much, and either increases or decreases could occur.

Capital losses and costs. Some producers will suffer capital losses from equipment, such as canning lines and can-vending machines rendered useless. These effects will be unevenly distributed, since some bottlers buy canned drinks and brewers with substantial out-of-state business can continue to employ canning lines in this trade.

Only those capital losses which affect bottlers, brewers, and distributers can possibly be passed on, thus the losses of can and glass manufacturers cannot be passed on in beer and soft drink prices.

Because Minnesota exports much of its beer, canning line capital losses can be expected to be small.

Can venders can be sold second-hand, out-of-state, or possibly exchanged for bottle venders. Losses are likely to be substantial, however.

The ability of a firm to pass on capital losses depends on the need of competitors to do so. As a general economic principle, bygones are bygones, and current customers cannot be expected to pay for past misjudgments. Because the capital losses are unevenly distributed, it is unlikely that they can be passed forward to consumers. Capital costs for new equipment will tend to be largest in those firms which were most committed to one-way container systems, hence to those firms that have the largest capital losses. These costs are ordinarily passed forward as a cost of production, hence should not lead to any increase in price.

The total effect of all these possible reasons for higher prices appears to be small. The critical influences on Minnesota prices will continue to be local brewers and national-brand soft drinks, and these are the firms which will face the smallest cost effects. It is reasonable to conclude that prices on returnables would change very little in the event of a ban, a situation which has apparently occurred in Oregon with its mandatory deposit law [2].

IV. Consumer Savings

If the prices of beverages in returnable containers do not change and the container-size mix does not change as the result of a ban, then consumers would spend less for the same liquid volume of beverages after a ban than they did before. This reduction in spending, termed "consumer savings," results from the ban, but should not be interpreted as a pure benefit. Consumers will lose the convenience of the one-way container which at least some of the purchasers were willing to pay for. This loss of convenience is one of the social costs of a ban. At the same time, the convenience of the one-way container to the individual consumer entails social costs external to the consumer in the solid waste and litter costs associated with and arising from beverage consumption. These include not only the costs of collection and disposal of solid waste and litter by public agencies but by individuals who must dispose of litter and solid waste on private property. In addition, there is the general social cost of litter which is suffered by everyone who contemplates it. Beautiful sights are marred by litter, and since people will pay substantial amounts of money to see beauty, they would presumably pay something to be free of litter. It is this widely held public attitude that justifies public litter collection expense. The net social benefit of a ban is the algebraic sum of the costs and benefits arising from the ban, and it is not to be confused with consumer savings which may be larger or smaller.

In the preceeding sections of this paper it has been argued that a ban would cause little or no change in the price and volume of beverages, hence consumer savings can be expected to be positive. In this section consumer savings are based on late 1972 prices and the

estimated volume of beverages sold in 1972.

The prices were collected in a survey in the Minneapolis-St. Paul area in December 1972 and are described in Appendix A. Beer sales of 1972 are stimated from official state data and the distribution package size and type are estimated from various national industry data. Soft drink sales of 1972 are estimated from national data from various sources and from Minnesota's 1967 share of national shipments. Sales and package data are described in Appendix B. Detailed package-mix data are lacking, so that many detailed assumptions have been made in preparing the estimates. The volume of liquid beverages sold in containers has been estimated in 12 ounce equivalents, but the estimated price differentials reflect the estimated size mix of containers and is not based purely on the price differentials of 12 ounce containers.

Soft drinks. The consumer savings from a shift to returnables depends strongly on the postban container size pattern. In the 12 ounce size, according to Appendix A, the per ounce price in cans is 1.4¢ and the comparable 10-12 ounce returnable bottle price is 1.26¢, while in the 26-32 ounce size the price in one-way bottles is 1.2¢ per ounce compared to .85¢ per ounce in returnables. If all sales in one-way containers were in the large sizes, consumer costs would decrease by 29 per cent, while if all sales were in 12 ounce one-way containers costs would decrease by 10 per cent. It is assumed that two-thirds of soft-drink sales are in the smaller sizes for which the 10 per cent reduction applies, and one-third of sales are in the larger sizes for which the 29 per cent reduction applies.

This is a somewhat larger proportion for the large sizes than is found in the 1967 data on soft-drink shipments by container size for Minnesota [9, p. 194], but the shift is assumed only to affect the approximately 50 percent of soft-drink sales which are for home consumption [10, p.30].

It is also assumed that three-fourths of can sales are in national brands, for which the 10 percent consumer cost reduction would apply, and that three-fourths of one-way bottle sales are national brands, for which the 29 percent consumer cost reduction would apply. No cost reduction is assumed for the one-fourth of sales in cans and one-way bottles assumed to be accounted for by local and controlled brands. It is assumed that all returnable sales are in national brands. These figures are set out in Table 10 and the estimated soft drink sales for 1972 with and without a ban on returnables are presented. Soft drink sales are estimated to be $40 million without a ban on one-way containers, and $36.12 million with a ban, indicating consumer savings from a ban of almost $4 million for soft drinks.

This estimate of $4 million in consumer savings does not assume any savings for consumers of local or controlled-brand soft drinks, nor does it assume any savings except for the home market. There may be additional savings for customers of vender and restaurant and other on-premise sales, but these are assumed not to be passed on to the consumer.

Table 10. Soft Drink Volume, Price Per Ounce, and Sales for Home Market and Total Case Sales, Estimated Consumer Savings from a Ban on One-Way Containers Minnesota, 1972 Estimated, and Postban

	Estimated 1972				Postban Prices and Sales			
		One-way	Returnable			One-way	Returnable	
Volume in billion ounces	Cans	bottles	large	small	Cans	bottles	(total)	
National brands	.9	.75	.417	.833	--	--	2.89	
Other brands	.3	.25	--	--	--	--	.55	
Total	1.2	1.00	.417	.833	--	--	3.44	
Price per ounce ¢							(large)	(small)
National brands	1.4	1.2	.85	1.26	1.26	.85	.85	1.26
Other brands	.75	.86	--	--	.75	.86	--	--
Sales ($ millions)					(by preban package type)			
National brands	12.6	9.0	3.5	10.5	11.34	6.38	3.5	10.5
Other brands	2.25	2.15	--	--	2.25	2.15	--	--
Total	14.85	11.15	3.5	10.5	13.59	8.53	3.5	10.5
Estimated Consumer Savings ($ million)								
National Brands	1.26	2.62	--	--				
Other brands	--	--						
Total	1.26	2.62						
Estimated Total Case Sales (millions)[a]								
Total soft drinks	8.33	6.94	---	--				

a. Cases of 12 oz. bottles or cans.

Source: Appendices A and B

Beer. Consumer savings from a ban on one-way beer containers are somewhat more difficult to estimate than for soft drinks. One of the consequences of a ban on one-way beer containers is likely to be significant shift from out-of-state beers to Minnesota beers, reversing the trend toward purchase of out-of-state beers. In 1972, according to data from Minnesota Liquor Control Department, 81 percent of 3.2 percent beer was produced in Minnesota, compared to 83 percent in 1971 and 84 percent in 1970. In 1972, 65 percent of strong beer sold in Minnesota was produced in Minnesota, compared with 66 percent in 1971 and 68 percent in 1970. The somewhat higher transportation costs of the returnable system for out-of-state brewers may lead some of them to abandon or deemphasize the Minnesota market, and the price differential between brewed and out-of-state beers might increase over the current level of about 1 cent a bottle. If so, then the return of consumers to Minnesota beers could be significant and consumer savings might be substantial. This would indicate an increase in the price of out-of-state beer, however, so it is assumed that there would be no net consumer savings from the expected shift to Minnesota beers.

It is assumed for purposes of analysis that the shift from one-way to returnable containers would affect prices of two-thirds of the market and that the remaining one third will retain any price saving and not pass it on to the consumer. Thus in Table 11, the package mix for 4.95 billion ounces of beer is estimated. It is assumed that the distribution of container types corresponds to the national pattern reported in Appendix B, and that the proportion of local beers to the total is the same for all container types and sizes. Data are lacking on the proportion of the market made up of premium and regular beers, and no price is available for

Table 11.

Estimated Sales of Beer by Volume in Minnesota, 1972

	Volume in billions of ounces			
	Total	Returnable	NR bottles	Cans
Strong beer	3.564	.916	.728	1.920
Local	2.317	.595	.473	1.248
Premium	1.544	.397	.316	.832
Regular	.733	.198	.158	.416
Out-of-state	1.247	.321	.255	.672
Premium	.831	.214	.170	.448
Regular	.416	.107	.085	.224
3.2 beer	1.386	--	.381	1.005
Local	1.123	--	.309	.814
Premium	.748	--	.206	.542
Regular	.375	--	.103	.272
Out-of-state	.263	--	.072	.191
Premium	.175	--	.048	.127
Regular	.088	--	.024	.054

Source: Appendix B.

returnables of regular beers in 3.2 beer, so it is assumed that all 3.2 beer has been sold in one-way containers and that returnables of regular 3.2 beer will cost the same as returnables of strong beer after a ban. It is assumed that one-third of total strong and of total 3.2 beer is regular beer. Using prices derived from Appendix A, total sales implied by the estimated package mix is given in Table 12. Estimated total beer sales in the current estimated package mix is about $87 million. Using returnable prices, but keeping the mix of 3.2 to strong, local to out-of-state, and premium to regular as before, estimated beer sales with a ban on returnables is about $72 million, so that estimated consumer savings from a ban on one-way containers for beer would be something over $14 million.

The estimated consumer savings of $14 million would be reduced if the prices of returnables increased above current levels. Some increase might be expected since case prices were the only returnable prices available and six-pack or twelve-pack returnable prices might be somewhat higher. Savings might be somewhat greater than estimated if there was a significant shift to local beer and if, as might be expected, 3.2 beer in returnables had a lower price than strong beer in returnables.

Table 12.

Estimated Beer Sales, 1972 and Postban, by Container Type

($ million)

	1972 Sales				Estimated sales after ban	Consumer Savings
	Total	Returnable	NR bottle	Cans		
Strong beer						
Local						
Premium	29.60	6.75	6.13	16.72	26.25	3.35
Regular	10.65	1.96	2.37	6.32	7.65	3.00
Out-of-state						
Premium	16.20	3.74	3.37	9.09	14.54	1.66
Regular	5.74	1.06	1.28	3.40	4.12	1.62
3.2 beer						
Local						
Premium	14.70	--	4.08	10.62	12.72	1.98
Regular	5.65	--	1.54	4.11	3.71	1.94
Out-of-state						
Premium	3.48	--	.99	2.49	3.06	.42
Regular	1.33	--	.36	.97	.87	.46

Source: Derived from Table 11 and Appendix A, Table A-2.

V. Employment Effects

The savings to consumers of approximately $18 million is substantial. It arises, of course, from the lower prices charged by bottlers and brewers for beverages in returnables, and, ultimately, from the lower packaging costs faced by bottlers and brewers with a shift to a completely returnable system. No change in unit costs or prices of returnables has been made, and there is no assumption that distributers or retailers gross margins decrease. To the contrary, it is to be expected that both distributers and retailers will have substantially higher margins (although not higher percentage markups on returnables) than they had before the ban. The higher gross margins of distributers' and retailers' will be used in part to pay the higher costs of handling a returnable system, and there is no way to tell if total profits of distributers and retailers on beverages will be increased or decreased by the shift to returnables. The loss of sales of packaging materials to bottlers and brewers will be much greater than the consumer savings because of the higher unit costs of handling in distribution associated with use of the returnable system.

The consumer savings of $18 million will probably be largely diverted to spending on goods other than beverages and will generate positive direct and indirect employment effects, while the shift to beverage sales in returnables will generate additional direct employment effects in bottling and brewing, distribution, and retailing. The decline in purchases of packaging materials by bottlers and brewers will generate negative direct and indirect employment effects.

It is impossible to estimate the employment effects directly from available data. Rather it seems best to estimate the economic effects in terms of bottling and distribution costs and the reduction in packaging sales and then to derive the employment effects from the implicit labor requirements for the changes in economic activities.

The first step in the analysis is to estimate the costs to retailers of handling the additional load of returnables. One available estimate of the labor costs of handling returnable bottles indicates a requirement of 2.8335 man-hours of labor per 1,000 bottles[11] It is estimated in Table 10 that a ban would require 2.2 billion additional ounces of soft drinks in returnables. Assuming a 16 ounce average container size, this is 137.5 million additional bottles which would require 389,606 additional man-hours of work at retail stores. Assuming 2,000 hours a year, this is 195 full-time equivalent workers.

From Table 11 it is estimated that 4.034 billion additional ounces of beer would have to be handled in returnables. Assuming a 12 ounce average bottle, this is equivalent to 336.2 million bottles, indicating a requirement for 952,528 man hours of labor. Assuming 2,000 hours a year, this implies need for 476 additional full-time equivalent workers in retail stores.

The next stage in distribution is at the wholesale distributer level. The function of moving beer from the brewer to the retailer is often handled in local beers by brewery employees and is usually handled for out-of-state beers by independent wholesale beer distributers.

Using the estimates of cases of beer distributed per employee from Table 13 based on the estimates of the Research Triangle Institute [3], and assuming that all locally brewed beer is distributed by brewery employees and all out-of-state beer is distributed by distributer employees, it is estimated that brewers will require 85 additional workers to distribute the 4.072 million cases of beer sold before the ban in one-way bottles, 262 additional workers to distribute the 10.74 million cases sold in cans. Wholesale distributers will require 29 additional workers for the 1.702 million cases of out-of-state beer sold in one-way bottles and 107 additional workers for the 4.495 million cases sold in cans. Thus an estimated total of 483 additional workers will be required in distribution of beer.

Soft drink bottlers will require 203 additional workers in distribution to handle the estimated 8.33 million additional cases of returnables which were formerly in cans, and 145 additional workers to handle the 6.94 million cases formerly in one-way bottles. Thus 348 additional workers will be required by bottlers in the distribution of soft drinks.

The next stage is the bottling of beer and soft drinks. Labor requirements are somewhat higher for returnables than for one-way containers. Labor costs for packaging are estimated at 30.77¢ a case for returnables, 19.27¢ a case for one-way bottles, and 8.82¢ a case for cans [7]. Estimating labor cost for a line worker at $4 an hour, leads to estimates of .0769 man-hours per case of

Table 13.

Cases Distributed Per Man-Year of Employment
Soft Drink Bottlers, Brewers and Beer
Distributers

	Cases distributed per man-year		
	Returnables	NR Bottles	Cans
Beer distributers	16,710	25,350	27,750
Brewers	16,740	25,390	27,770
Soft drink bottlers	16,300	24,720	27,040

Source: Tayler H. Bingham and Paul F. Mulligan, An Analysis of the Beverage Container Problem with Recommendations for Government Policy, pp. A-106, A-108 (Research Triangle Park, North Carolina: Research Triangle Institute, 1972).

returnables, 0.0482 man-hours per case of one-way bottles, and 0.022 man-hours per case of cans. This indicates that local brewers will require 58 additional line workers for the beer formerly in one-way bottles and 293 line workers for the beer formerly in cans. This additional employment is expected to occur in Minnesota. In addition, out-of-state brewers will require 24 workers for the beer formerly in one-way bottles and 123 workers for the beer formerly in cans.

Soft drink bottlers will require 100 additional workers for the soft drinks formerly in one-way bottles and 227 additional workers for the soft drinks formerly in cans.

The remaining employment effects are the direct and indirect effects resulting from the reduction in purchases of packaging materials. Most of these costs arise in can and bottle production, and the small effects in miscellaneous industries including the production of labels, adhesives, and detergents are ignored here. Koch estimates that costs of crowns, cartons, and glass for beer in one-way bottles is 75.33¢ per case. This amounts to $4.35 million for the one-way bottles replaced by returnables[7]. He also estimates the cost of cans and lids for beer at 98.23¢ per case, or $14.96 million for the beer in cans replaced by returnables. Using the same figures for soft drinks, a reduction in purchases of crowns, cartons, and glass of $5.23 million for soft drinks formerly in one-way bottles and a reduction of $8.18 million for soft drinks formerly in cans is obtained.

Aggregate reductions in packaging purchases for cans and lids is about $23.8 million and for glass packaging about $9.6 million.

The shift of beverages to returnables will entail costs for returnable beverage bottles. There will be an important impact effect in glass container manufacture as bottlers and brewers build up their inventories and float, but this is not examined. The process will be important in cushioning the employment effects in the glass container industry. Assuming that a returnable beer bottle costs 3.5¢ and a returnable soft-drink bottle costs 10¢ and that trippage is twenty for each of these containers, the glass costs of 4.2 cents per case of beer leads to total costs of $840,000 and the glass costs of 11.4¢ a case for soft drinks leads to glass costs of $1,741,000 for containers to replace the one-way bottles and cans. Thus approximately $2.6 million a year of returnable container losses changes the reduction in glass spending from the $9.6 million estimated above to $7 million. Thus the net reduction in container costs is estimated to be $30.8 million.

To estimate the direct and indirect employment effects of this reduction in purchases of cans and bottles by the beverage industries input-output analysis is used. A similar analysis has already been carried out in the Illinois study [1], and the results of that study can be adapted for use here. The estimated reduction in can spending in Illinois was $88 million, so the $23.8 million reduction in Minnesota will lead to employment effects that are 27 per cent as large as those estimated for Illinois. The estimated reduction in glass purchases of $7 million in Minnesota is 54.26 per cent of the estimated Illinois reduction of $12.8 million. The direct and indirect

employment effects of the reduction in cans and bottles are given in Table 14.

Summary of the direct and indirect employment effects is as follows:

Reductions in employment	
Metal cans	433
Glass containers	301
Indirect effects from metal cans	806
Indirect effects from glass containers	118
Total reductions	1,658
Increases in employment	
Retail trade	671
Beer distribution	483
Soft-drink distribution	348
Beer bottling	498
Soft-drink bottling	327
Total increases	2,327
Net increase in employment	669

These estimates are not complete, but they include most of the major effects. One specific omission is a reduction in solid waste handling and litter collection which might run to 200 or 300 jobs. In addition to these measured effects in the directly concerned industries consumers can be expected to spend the $18 million consumer savings. If they spend some of this on more beverages,

Table 14.

Estimated Direct and Indirect Employment Effects of Reduction in Can and Bottle Purchases as a Result of the Ban, Minnesota

Industry (SIC Code)	Input-output industry	Employment reduction from Cans	Employment reduction from Bottles
Glass containers (322)		--	301
Metal cans (3411)		433	--
Coal mining (11,12)	7.0	23	--
Petroleum & gas (1311,2)	8.0	4	8
Stone & clay (141,etc)	9.0	--	7
Paper mills (2611)	24.02	5	---
Paperboard mills (2631)	24.03	--	2
Paperboard ctnrs (265)	25.00	23	29
Comm. printing (2751,2)	26.05	61	--
Ind'l chemicals (281)	27.01	17	21
Paints (2851)	30.00	18	--
Petr. ref. (2911,299)	31.01	4	2
Abrasive prod. (3291)	36.16	--	4
Basic steel (331)	37.01	379	--
Prim. aluminum (3334)	38.04	3	--
Alum. rolling (3352)	38.08	12	--
Railroads (40,474)	65.01	62	--
Motor freight (42,473)	65.03	39	10
Water transport (44)	65.04	16	--
Elec. util. (491,pt.493)	68.01	7	3
Gas util. (492,pt.493)	68.02	6	6
Wholesale trade (50)	69.01	89	16
Credit agencies (61,67)	70.01	5	2
Misc.bus.serv. (73,7694)	73.01	33	8
Advertising (731)	73.02		

Source: Derived from Hugh Folk, Employment Effects of the Mandatory Deposit Regulations, tables 8 and 9 (Springfield and Chicago: Illinois Institute for Environmental Quality, Document 72-1, 1972).

the glass reductions will be smaller and the increases in employment in beverage production and distribution will be larger. If the $18 million in consumer savings is spent on other commodities and services, it should have a direct and indirect employment effect of creating perhaps 1,200 jobs. This suggests that the total direct and indirect employment effects resulting from a ban on one-way containers could amount to an increase in employment of about 1,500 to 2,000 jobs.

The increase in employment arises from the labor-intensive character of the returnable beverage container system compared with the one-way systems, but ultimately the increase in employment arises from the fact that wages are generally lower in the industries which are positively affected than in the industries which are negatively affected.

There is no good way to identify the proportion of the increases and decreases which will occur within Minnesota. It is not debatable, however, that most of the increases in retail trade, distribution, and bottling and brewing that occur will occur in Minnesota. It is likely that most of the reductions in metal can and glass container manufacture will also occur in Minnesota, but it should be remembered that Minnesota is an important exporter of beer and that much of the exported beer going to other states will continue to be in one-way containers. The indirect reductions will probably be much less concentrated in Minnesota than are the direct reductions.

VI. Summary and Conclusions

A ban on one-way containers can be expected to have significant effects on employment in industries involved in the production and distribution of beer and soft drinks. It does not seem likely that a ban would lead to a decrease in total sales of beer or soft drinks or to increases in the prices of beverages in returnable bottles. The major effect of a ban would be to shift consumer buying from beverages in one-way containers to similar beverages in returnables. Since beverages in returnables are usually priced somewhat lower than the same brands in one-way containers, the shift would lead to a substantial cost saving for consumers, amounting to an estimated $18 million.

The substitution of returnable containers for one-way containers would probably work to the advantage of local brewers and local nationally franchised brands and to the disadvantage of out-of-state brewers and the controlled and local brand soft drink bottlers.

Significant employment decreases in can and bottle manufacture and in those industries which supply inputs to the can and bottle industries would result from the reduction in sales of containers to brewers and bottlers. Increases in employment in retail trade and in soft drink and beer production and distribution would result from the higher costs of bottling and transporting beverages in returnable containers. Aggregate reductions in employment would be about 1,658 jobs and aggregate increases in related industries would be about 2,327 jobs. In addition, consumer spending of the estimated $18 million of consumer savings would generate about 1,200 addition jobs, suggesting a net increase in employment of

1,500 to 2,00 jobs.

Most of the increases in employment would occur in Minnesota, while many of the decreases, especially in indirectly related industries would occur outside of the state.

This study does not purpose to be a complete study of the costs and benefits of a ban on one-way containers. It does show, however, that the employment effects in net balance are not unfavorable. It must be recognized that the employment reductions are concentrated in the metal can and glass container industries. If a ban is adopted, a lead time of a year would be helpful in cushioning the employment impact of the ban and in permitting bottlers, brewers, and retailers to prepare for the changes which will take place.

The occurrence of employment reductions concentrated in particular industries does not constitute a strong argument against legislation which is desirable on other grounds. The employment in the container industries is, in a very real sense, a substitute for employment in the beverage production and distribution industries which once were engaged in operating the returnable system. Changes in the industrial distribution of employment are the normal consequence of economic growth and change. Changes such as those which will occur with the adoption of a ban on one-way containers can be readily absorbed in the economy as long as it remains vigorous and expanding.

REFERENCES

American Can Company. Carbonated Beverages in the United States -- Historical Review. 1972.

American Can Company. A History of Packaged Beer and Its Market in the United States. New York, 1969.

Beverage Industry Annual Manual. 1972-73.

Bingham, Taylor H. and Mulligan, Paul F. An Analysis of the Beverage Container Problem with Recommendations for Governmental Policy. Research Triangle Park, North Carolina: Research Triangle Institute, 1972.

Booz-Allen and Hamilton, Inc. Study of Distribution Practices in the Soft Drink Industry, 2 vols. Washington: National Soft Drink Association, 1968.

Bottle Survey '71. A California Supermarket Report on the Cost of Handling Returnable Soft Drink Bottles. LaHabra, California: Alpha Beta Acme Markets, 1971.

Edwards, Tom. "Oregon Beer Sales Have Not Suffered Under New Deposit Law" Peoria Journal Star, January 5, 1973, pp. A-11.

Folk, Hugh. Employment Effects of the Mandatory Deposit Regulations. Springfield and Chicago: Illinois Institute for Environmental Quality Document 72-1, 1972.

Folk, Hugh. U.S., Senate, Committee on Commerce, Statement in Hearings before the Subcommittee on the Environment, March 6, 10, 13, 1972, pp. 298-301.

Koch, Robert H. "Bottling Efficiency -- A Myth?" Brewers Digest, January 1970.

Midwest Research Institute. The National Economic Impact of a Ban on Nonrefillable Beverage Containers. Kansas City, Missouri: Midwest Research Institute, 1971.

United States Brewers Association, Inc. The Brewing Industry in the United States. Washington, D.C.: Brewers Almanac, 1970.

Appendix A

Minneapolis-St. Paul Beverage Price Survey

Prices are needed to carry out the consumer cost analysis. The limited time available for the study and limited resources restricted the price survey to the Minneapolis-St. Paul area. Package prices for major national brands (Coca-Cola, Pepsi Cola, and Seven-Up), local brands (Gold Medal and Tom Moore) and a controlled brand (Brimfull) were collected on the 26th and 27th of December by Ms. Jacquelyn M. Burke, Research Analyst, Minesota Pollution Control Agency, according to instructions of the author. An independent supermarket near the university campus an inner city chain supermarket, a chain supermarket in a middle-class suburb, a middle-class suburban stop-and-shop, a low-income neighborhood grocery, and a liquor store in a middle-class suburb were surveyed.

For the beer sample, strong beer was priced in a middle-class suburban liquor store, an inner city liquor store, and a liquor store in a low-income area. The sample for 3.2 beer included a neighborhood grocery in a low income area, a grocery store near the university, and a middle-class suburban stop and shop. Prices were collected for two local premium brands (Hamm's and Grain Belt), two national premium brands (Budweiser and Schlitz), and a local regular beer (Buckhorn).

Soft drink prices. Simple averages of prices by container type, brand type, and container size were calculated and are given in terms of price per ounce in Table A-1.

Table A-1

Average Price of Soft Drink Per Ounce,
by Size and Container Type

Container size	64-48	26-32	16	10-12	6½-7
Returnable					
National (a)	-	.85	1.02	1.26	1.80
Nonreturnable					
National (a)	1.10	1.20	-	1.40(d)	-
Local (b)	1.08	.86	-	-	-
Controlled (c)	-	-	-	.75(d)	-

a. Coca-Cola, Pepsi Cola, 7-Up

b. Gold Medal, Tom Moore

c. Brimfull

d. Can

Beer prices. Beer prices were averaged by brand type, beer type, and container size, and average prices per ounce obtained are presented in Table A-2.

Table A-2

Price of Beer Per Ounce,
by Type and Container

Minneapolis - St. Paul, December, 1972
(price in cents per ounce)

Container type	Returnable	Nonreturnable bottle		Can	
Container size	12	32	12	12	16
Strong beer					
Local premium	1.70	1.86	1.94	2.01	1.84
National	1.75	1.85	1.98	2.03	1.86
Local regular	.99	--	--	1.52	--
3.2 Beer					
Local premium	--	1.78	1.98	1.96	1.81
National	--	1.84	2.07	1.96	1.84
Local regular	--	--	--	1.51	--

Appendix B

Estimated 1972 Minnesota Beverage Sales by Container

In the first half of 1972, according to the Minnesota Liquor Control Department, 1,194,944 31 gallon barrels of beer were taxed for sale in Minnesota. It is assumed that 1972 total sales will be twice this level, or 2,389,888 barrels. Assuming that the same proportion of 1972 Minnesota beer sales will be in packages as the 1969 proportion of packaged beer to total production in Minesota [12, Table 9], or 78.3 percent, 7.425 billion ounces of packaged beer will be sold.

Assuming that the 1972 distribution of beer packages will be that estimated for the United States for 1972 by the Beverage Industry Annual Manual, 1972-73, Table 2, p. 23, or 59.1 percent in cans, 22.4 percent in one-way bottles, and 18.5 percent in returnable bottles, the estimated number of ounces of beer sold will be 4.388 billion in cans, 1.663 billion in one-way bottles, and 1.663 billion in one-way bottles, and 1.374 billion in returnable bottles.

In 1972, an estimated 47 billion 12 ounce equivalent containers of soft drinks were sold, according to the 1972-73 Beverage Industry Annual Manual, Table 1, p.23, of which 16.4 billion were in cans, 13.6 billion in one-way bottles, and 17 billion in returnable bottles. Assuming that Minnesota's share of 1972 sales were the same as its share of bottled soft drink shipments in the 1967 Census of Manufactures, or 1.22 percent, and that the package mix was the same in Minnesota as nationally, there were an estimated 200 million cans, 166 million one-way bottles, and 207 million returnable bottles of soft drinks sold in Minnesota.

This is equivalent to 2.4 billion ounces in cans, 2 billion ounces in one-way bottles, and 2.5 billion ounces in returnable bottles.

BIBLIOGRAPHIC DATA SHEET	1. Report No. UIUC-CAC-DN-73-73	2.	3. Recipient's Accession No.
4. Title and Subtitle: TWO PAPERS ON THE EFFECTS OF MANDATORY DEPOSITS ON BEVERAGE CONTAINERS			5. Report Date: January 1973
			6.
7. Author(s): Hugh Folk			8. Performing Organization Rept. No. CAC-73
9. Performing Organization Name and Address: Center for Advanced Computation, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801			10. Project/Task/Work Unit No.
			11. Contract/Grant No.
12. Sponsoring Organization Name and Address: Illinois Institute for Environmental Quality, 309 W. Washington St., Chicago, Illinois 60606	Minnesota Pollution Control Agency, 717 S.E. Delaware St., St. Paul, Minn.		13. Type of Report & Period Covered: Research
			14.

15. Supplementary Notes

16. Abstracts

Paper 1: The regulation requiring a five cent deposit on all beverage containers proposed by the Solid Waste Management Task Force of the Illinois Institute for Environmental Quality for adoption by the Illinois Pollution Control Board can be expected to have significant employment effects. This report attempts to identify and measure these employment efects using straight-forward economic impact analysis. Paper 2: This report attempts to identify the economic effects of a ban on nonreturnable containers and the measure the empact of a ban on consumer costs and employment in Minnesota. Most of the conclusions reached in this study would also apply to a mandatory deposit law which did not ban returnables. The Illinois analysis was based on the assumption that mandatory deposits would lead to an essentially complete shift from nonreturnables to returnables. This is open to argument, and it can be expected that nonreturnables would persist in some sales situations despite the imposition of a mandatory deposit.

17. Key Words and Document Analysis. 17a. Descriptors

Beverage industry
Nonreturnables
Litter
Solid waste
Mandatroy deposit

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
No restriction on distribution. Available from National Technical Information Service, Springfield, Virginia 22151	UNCLASSIFIED	62
	20. Security Class (This Page) UNCLASSIFIED	22. Price

BOUND BY
IHNM

UNIVERSITY OF ILLINOIS-URBANA
510.84IL63C C001
CAC DOCUMENT$URBANA
71-75 1973
3 0112 007264176